ISSN 2521-4012

臺灣研蟲誌

Taiwanese Journal of Entomological Studies



第二卷，第四期

臺灣昆蟲同好會

Taiwanese Society of Insect Natural History

Vo. 2, No. 4, December 25, 2017

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http://zoobank.org/urn:lsid:zoobank.org:pub:7EFA793F-E91C-4D0C-8681-23BD185F324F

臺灣長郭公蟲複眼畸形個體發現之短記 (鞘翅目：郭公蟲科)

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摘要：臺灣長郭公蟲 (*Opilo formosanus* Schenkling, 1912) 之複眼畸形個體首次觀察紀錄。

關鍵詞：複眼、畸形、郭公蟲科

前言

根據臺灣物種名錄 TaiBNET 網站，目前臺灣已被描述紀錄的郭公蟲科 (Cleridae) 有 25 屬 62 種 (Taiwan Catalogue of Life, 2017)。在臺灣的海濱地區，第一作者目前觀察紀錄過的郭公蟲科共有 4 種：赤足郭公蟲 *Necrobia rufipes* (DeGeer, 1775) (圖一C)、雙色琉璃郭公蟲 (赤頸郭公蟲) *Necrobia ruficollis* (Fabricius, 1775) (圖一B)、尚待釐清的 *Stigmatium* sp. 一種 (圖一A) 和臺灣長郭公蟲 *Opilo formosanus* Schenkling, 1912 (圖二)。其中赤足郭公蟲均發現於海灘的魚類屍骸上 (澎湖縣西嶼鄉赤馬村: 01. V. 2011; 桃園市大園區沙崙里: 08. VII. 2012; 屏東縣車城鄉海口村: 19. VI. 2010)；雙色琉璃郭公蟲僅一次紀錄，發現於綠蠵龜 *Chelonia mydas* (Linnaeus, 1758) (Chordata: Reptilia: Testudines: Cheloniidae) 的屍骸上 (新北市三芝區後厝里: 22. III. 2009)；臺灣長郭公蟲則發現於海岸林中 (新北市石門區德茂里: 02. VI. 2007; 04. VI. 2016)；而 *Stigmatium* sp. 亦是發現於海岸林中 (新北市石門區德茂里: 08. XI. 2015) (J. J Cherng, 個人觀察)。此外，基隆市中正區棉花嶼 (Mianhua Islet) 也曾記錄過赤足郭公蟲和雙色琉璃郭公蟲 (Chang, 1995)。

自然環境下的甲蟲畸形個體一般不易見到，相關的觀察紀錄散見於如步行蟲科 (Carabidae)、天牛科 (Cerambycidae)、擬步行蟲科 (Tenebrionidae)、擬天牛科 (Oedemeridae)、象鼻蟲科 (Curculionidae) 等 (e.g., Tovar et al., 2014; Ghannem et al., 2015; Sapronov, 2017)，郭公蟲科的畸形個體記錄包括了中、後足脛節和後腿節極度彎曲 (見於伊朗產之 *Phloiocopus magnanii* Zappi, 2014; Zappi, 2014) 以及翅鞘發育過小併合色斑不對稱 (見於西班牙產之 *Trichodes leucopsideus* (Olivier, 1795); Tovar et al., 2014)。

長郭公蟲屬 (*Opilo* Latreille, 1802) 目前臺灣已被描述紀錄的種類有 5 種 (Taiwan Catalogue of Life, 2017)，其中臺灣長郭公蟲 (*Opilo formosanus* Schenkling, 1912) 是分布於臺灣和日本沖繩的種類 (Löbl et al., 2007)。2016 年 6 月 4 日夜間，第一作者於新北市石門區德茂里海灘，利用燈光誘集法採集到一隻複眼自然畸形的臺灣長郭公蟲，觀察記錄敘述如下。

材料與方法

本研究所使用之燈光誘集法之光源為 HID 12V 15W 6000K 燈泡，存證標本存放於徐渙之 (Huan-Chih Hsu) 先生私人收藏 (HCHC: H.-C. Hsu’s personal collection, Taipei, Taiwan)。照片拍攝器材為 Canon 7D 數位單眼相機，搭配 Canon EF 100mm f2.8L Macro IS USM 鏡頭、Canon SpeedLite MT-24EX 微距閃燈。性別未明標本個體以 ex 表示。

結果

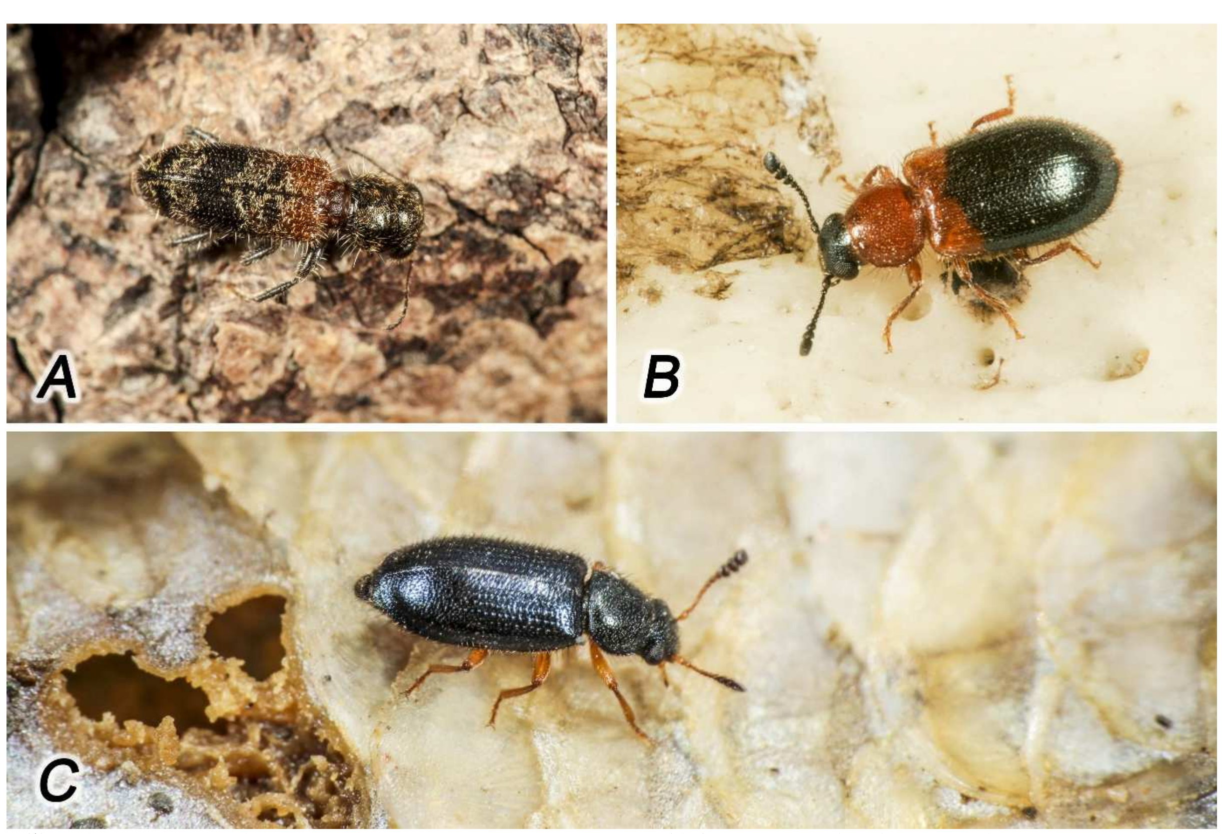
臺灣長郭公蟲
***Opilo formosanus* Schenkling, 1912**
(圖二)

標本檢查： 1 ex, Demaoli Beach, Shihmen Dist., New Taipei City, Taiwan, 4. VI. 2017, J.-J. Cherng leg., by light trap (HCHC).

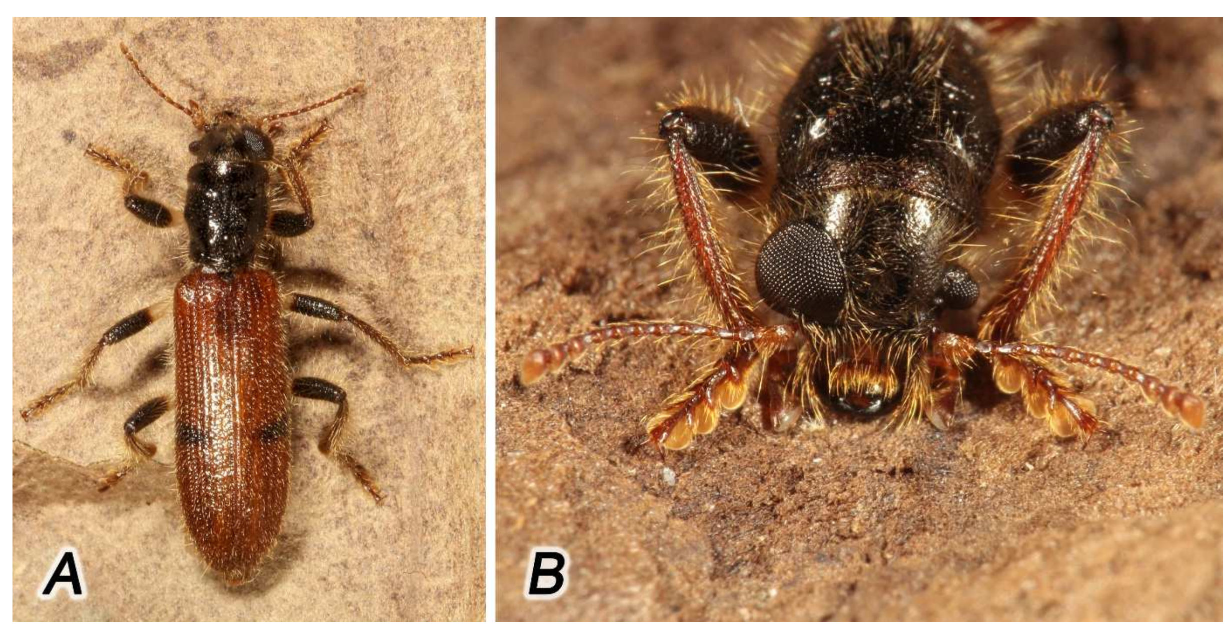
稿件收到 *Received: 17 October 2017*
稿件接受 *Accepted: 04 November 2017*
稿件出版 *Published: 25 December 2017*

觀察記述：2016 年 6 月 4 日夜間，於新北市石門區德茂里海灘之高潮線上的灘地架起 HID 燈具和白色布幕進行燈光誘集，燈光誘集全程耗時約 3 個小時 (自 20:00 到 23:00)。灘地的前方是潮間帶，後方主要是由林投 (*Pandanus odoratissimus* L. f., 1781) 和黃槿 (*Hibiscus tiliaceus* L., 1753) 所組成的海岸林。一共誘集 4 隻臺灣長郭公蟲 (*Opilo formosanus*) ，而其中 1 隻為本文所記述之自然畸形個體 (圖二A) ，該個體的左複眼異常的小 (圖二B)。

分布：臺灣、日本 (琉球群島) (Löbl et al., 2007)。



圖一、臺灣海濱地區的郭公蟲相：A. *Stigmatium* sp. (已死亡)；B. 雙色琉璃郭公蟲 (赤頸郭公蟲) *Necrobia ruficollis* (發現於綠蠵龜屍骸)；C. 赤足郭公蟲 *Necrobia rufipes* (發現於魚類屍骸)。



圖二、臺灣長郭公蟲 (*Opilo formosanus* Schenkling, 1912)：A. 畸形個體；B. 頭部特寫。

誌謝

本研究特別感謝施欣言先生協助鑑識 *Stigmatium* sp. 及徐渙之先生 (六足企業社，台北) 於第一作者燈光誘集和野外觀察時的諸多協助。

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Notes on a Case of Teratological Compound Eye in *Opilo formosanus* Schenkling, 1912 (Coleoptera: Cleridae)

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Abstract. The first observational record of *Opilo formosanus* Schenkling, 1912 with a teratological compound eye from Taiwan.

Key words: Compound eye, teratology, Cleridae

臺灣研蟲誌 Taiwanese Journal of Entomological Studies 2(4): 4-7 (2017)

[研究文章 Research Article]

http://zoobank.org/urn:lsid:zoobank.org:pub:841FD996-E6DA-48A8-8A78-554E28CA4F44

New Records of *Bolcocius granulosus* (Sharp, 1885) (Coleoptera: Zopheridae) from Taiwan, with a Key to Taiwanese Species of *Bolcocius*

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Abstract. *Bolcocius granulosus* (Sharp, 1885) is newly recorded from Taiwan. A key to Taiwaese species of the genus is provided.

Key words: Zopheridae, Colydiinae, *Bolcocius*, new faunistic record, Taiwan

Introdution

The genus *Bolcocius* Dajoz, 1975 is widely distributed in Japan, Taiwan, China, India, Indonesia, Pacific Islands, New Guinea and Australia (Dajoz, 1975; Ślipiński et al., 1999). However, only one species (*B. formosanus* Sasaji, 1984) of the genus has been recorded from Taiwan. The genus is morphologically similar to *Colobicus* Latreille, 1807, but it can be distinguished by the combination of following characters: narrower and convex body; pronotal and elytral margins at most narrowly explanate; interfacetal setae in the form of long stout bristles; antennomere III much shorter than the combined length of I and II. (Ślipiński et al., 1999; Aoki, 2012). The genus *Bolcocius* in East Asia has been studied by some Japanese entomologists such as Hiroyuki Sasaji and Junichi Aoki.

I've visited the Taiwan agricultural Research Institute, Wufeng, Taichung, Taiwan recently in order to examine specimens of zopherid beetles and found specimens of *Bolcocius granulosus* (Sharp, 1885) collected in Taiwan. Hence, I herein report this new faunistic record from Taiwan, and provide notes on morphological characters, which are needed for the identification. In addition, some important literature for studying on this genus occurred in East Asia are catalogued below.

Material and methods

All materials examined in this paper are deposited at the Taiwan Agricultural Research Institute, Wufeng, Taichung, Taiwan (TARI, Dr. Chi-Feng Lee). Abbreviation used in the text: ex – unidentified sex specimen(s).

Results

Bolcocius granulosus (Sharp, 1885)

(Figs. 1–3)

Colobicus granulosus Sharp, 1885: 65.
Bolcocius granulosus: Sasaji, 1984: 38; Sasaji, 1985: 293; Ślipiński & Schuh, 2008: 81; Aoki, 2009: 41 & 144; Aoki, 2012: 57.

Material examined. TAIWAN: 1 ex., Shitou, Nantou Country, 1. II. 2005, C.-F. Lee leg. (TARI); 2 ex., Shitou, Nantou Country, 18. III. 2004, C.-F. Lee leg. (TARI).

Differential Diagnosis. It can be easily distinguished from any other *Bolcocius* species occurred in East Asia by the combination of following characters: larger body; apex of elytral setae sharped; posterior margin of pronotum arcuate.

稿件收到 *Received: 25 October 2017*
稿件接受 *Accepted: 21 November 2017*
稿件出版 *Published: 25 December 2017*

Comment. This species has been recorded from Japan (Honshu, Shikoku, Kyushu and Tsushima) and China (Southwestern Territory), excluded Taiwan. The present study firstly confirmed and proposed its first record from Taiwan.



Figure 1. Dorsal view of *Bolcocius granulosus* (Sharp, 1885). Scale: 0.5 mm.

Key to Taiwanese species of the genus *Bolcocius* Dajoz, 1975

Larger body; setae on elytra rounded apically……………………………………...…………….*B. formosanus* Sasaji, 1984 (Fig. 2)
Smaller body; setae on elytra sharped apically……………………………………..….………..*B. granulosus* (Sharp, 1885) (Fig. 3)



Figure 2. Elytral setae of *B. granulosus* (Sharp, 1885), showing elytral setae sharped apically. Scale: 0.1 mm.

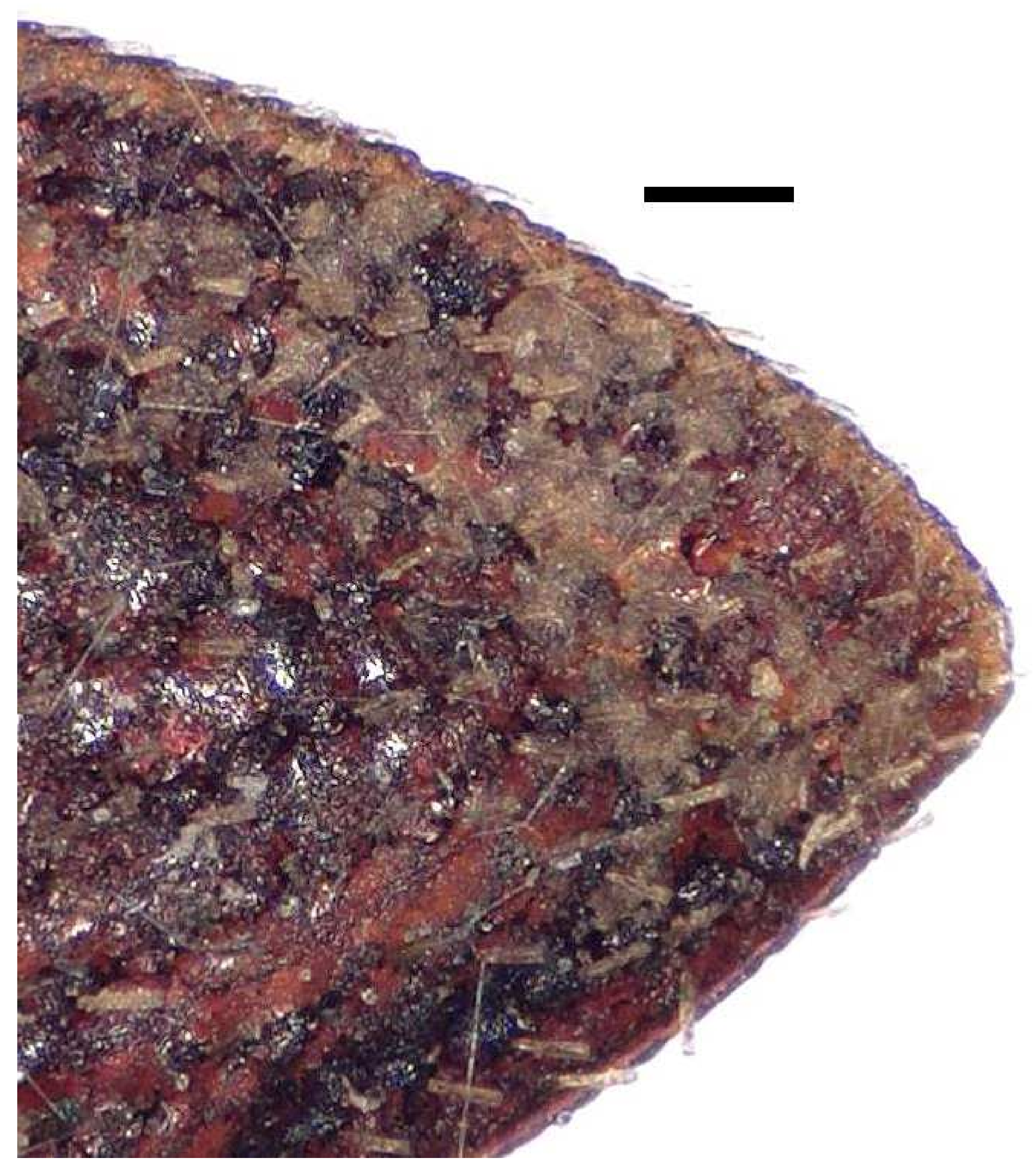


Figure 3. Elytral setae of *B. formosanus* Sasaji, 1984, showing elytral setae rounded apically. Scale: 0.1 mm.

Acknowledgment

The author would like to thank Dr. Chi-Feng Lee (TARI) for the loan of cylindrical bark beetles for the present study.

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臺灣新紀錄種粒面丸形細堅蟲之記述及臺灣產丸形細堅蟲屬檢索表 (鞘翅目：瘤擬步行蟲科)

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摘要: 粒面丸形細堅蟲 *Bolcocius granulosus* (Sharp, 1885) 新紀錄於臺灣，本文同時提供臺灣產丸形細堅蟲屬檢索表。

關鍵詞: 瘤擬步行蟲科、細堅蟲亞科、丸形細堅蟲屬、物種相新紀錄、臺灣

臺灣研蟲誌 Taiwanese Journal of Entomological Studies 2(4): 8-12 (2017)

[研究文章 Research Article]

http://zoobank.org/urn:lsid:zoobank.org:pub:11FAAF93-CD56-438A-9C3D-AD934B70030F

A New Record of *Pheidole hainanensis* Chen, Ye, Lu, & Zhou, 2011 (Hymenoptera: Formicidae) from Vietnam

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Abstract. *Pheidole hainanensis* Chen, Ye, Lu, & Zhou, 2011 is previously known only from Hainan Province, China. In the present paper, this species is newly recorded from the Chu Yang Sin National Park, Dak Lak Province, Vietnam. A partial sequence (Folmer region) of mitochondrial COI gene is also provided for DNA barcoding in the future studies.

Key words: Myrmicinae, ant, Indo-Chinese Peninsula, DNA barcoding

Introduction

The genus *Pheidole* Westwood, 1839 is one of the most abundant and species-rich genera of ants in the world, and contains more than a thousand valid species (Wilson, 2003; Bolton, 2017). The worker caste of *Pheidole* ants is typically subdivided into two morphologically distinct subcastes: the major worker (major) and minor worker (minor).

Pheidole hainanensis Chen, Ye, Lu, & Zhou, 2011 was originally described from Hainan Province, China, and has never been recorded outside Hainan Island. In the course of our recent field survey in an evergreen forest in Central Highlands of Vietnam (Chu Yang Sin National Park, Dak Lak Province: Fig. 1), a colony fragment of *P. hainanensis* was collected. In the present paper, *P. hainanensis* is newly recorded from Vietnam, highlighting its distribution in the Indo-Chinese Peninsula. Additionally, a partial sequence (Folmer region) of mitochondrial COI gene is also provided for DNA barcoding in the future studies.

稿件收到 *Received: 07 December 2017*
稿件接受 *Accepted: 15 December 2017*
稿件出版 *Published: 25 December2017*

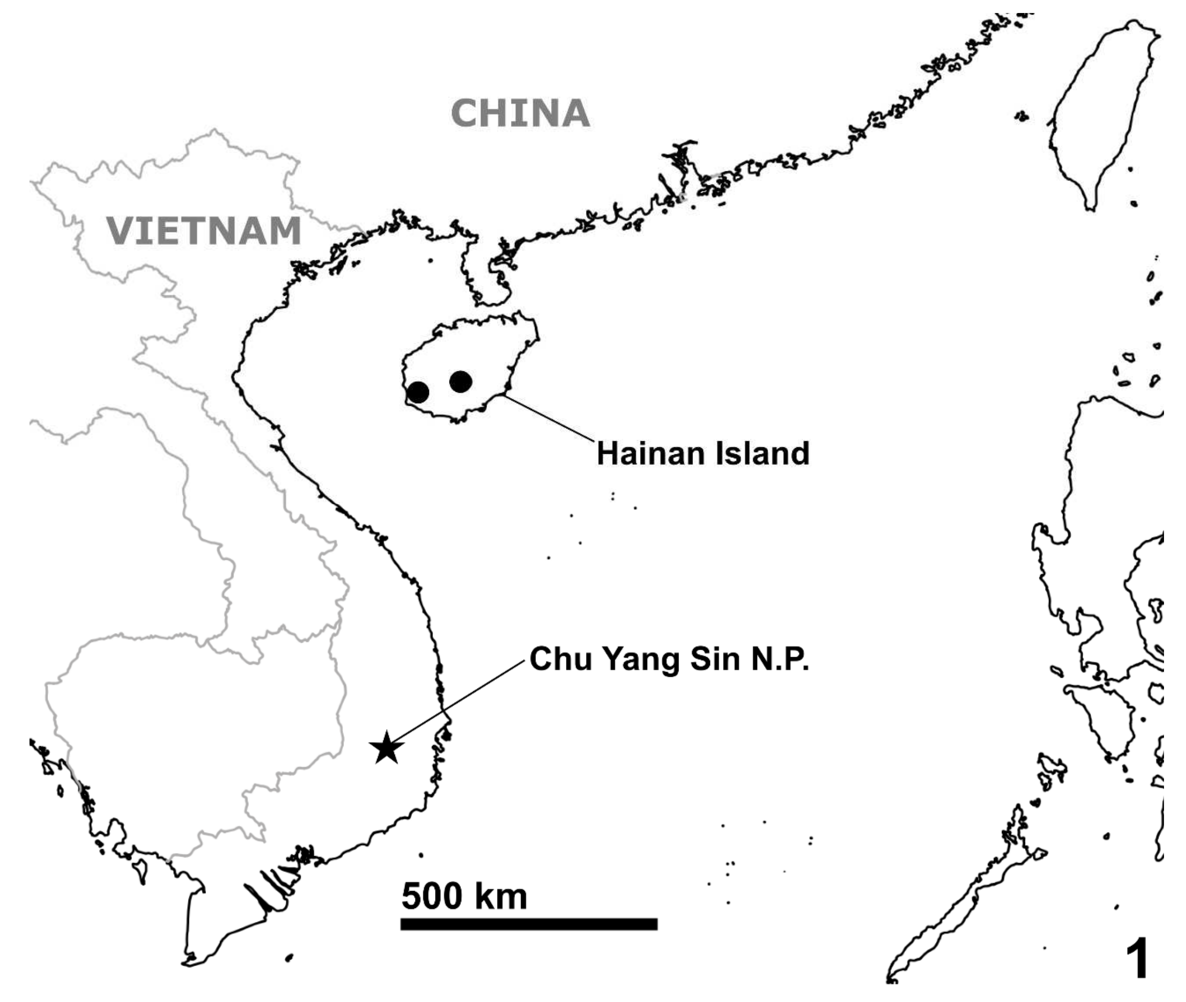


Figure 1. Distribution map of *Pheidole hainanensis*. The new record is shown by a black star.

Material and methods

The materials examined in this paper will be deposited in the following collections: the Institute of Ecology and Biological Resources, Vietnam (IEBR); Systematic Zoology Laboratory, Tokyo Metropolitan University, Tokyo, Japan (TMUZ: curated by the first author). Multi-focused images were produced by Helicon Focus Pro 6.7.1 (Helicon Soft Ltd.) from a series of source images taken using a Lumix DMC GX8 digital camera attached to a Nikon AZ100 stereomicroscope. The color balance and contrast were adjusted using GIMP 2.8 (available at http://www.gimp.org).

Measurements and indices were taken as follows: head length (HL: maximal head length between transverse lines spanning the anteriormost points of clypeus and posteriormost points of head); head width (HW: maximal head width excluding eyes); scape length (SL: length of antennal scape excluding the basal condylar bulb); pronotal width (PW: maximal width of pronotum in dorsal view); mesosomal length (ML: diagonal length of mesosoma in lateral view, from the base of anterior slope of pronotum to the posterobasal angle of metapleuron); petiolar length (PtL, from the anterodorsalmost point of petiolar peduncle to the posterodorsal corner of petiole in lateral view); petiolar width (PtW, maximal width of petiolar node in dorsal view); postpetiolar length (PPtL, maximal length of postpetiole in lateral view, excluding helcium); postpetiolar width (PPtW, maximal width of postpetiole in dorsal view); cephalic index (CI = HW/HL × 100); scape index (SI = SL/HW × 100); petiolar index 1 (PtI1 = PtL/PPtL × 100); petiolar index 2 (PtI2 = PtW/PPtW × 100).

A minor was used for DNA extraction by Chelex-TE method (details see Satria et al., 2015). Then, a 658 bp region (Folmer region) of the mitochondrial cytochrome c oxidase subunit I (COI) gene was amplified using the primers LCO-EG and HCO-EG (Eguchi et al., 2016). PCR amplifications, cycle sequencing reactions, sequencing using ABI PRISM 3130xl (Applied Biosystems) and sequence assembly using ChromasPro 1.7.6 (Technelysium Pty Ltd.) were conducted by following Rijal et al. (2015). The determined sequence (590 bp) was submitted to International Nucleotide Sequence Database (INSD: http://www.insdc.org) via DNA Data Bank of Japan (DDBJ): accession number LC341396.

Results

***Pheidole hainanensis* Chen, Ye, Lu, & Zhou, 2011**

(Figs. 2–10)

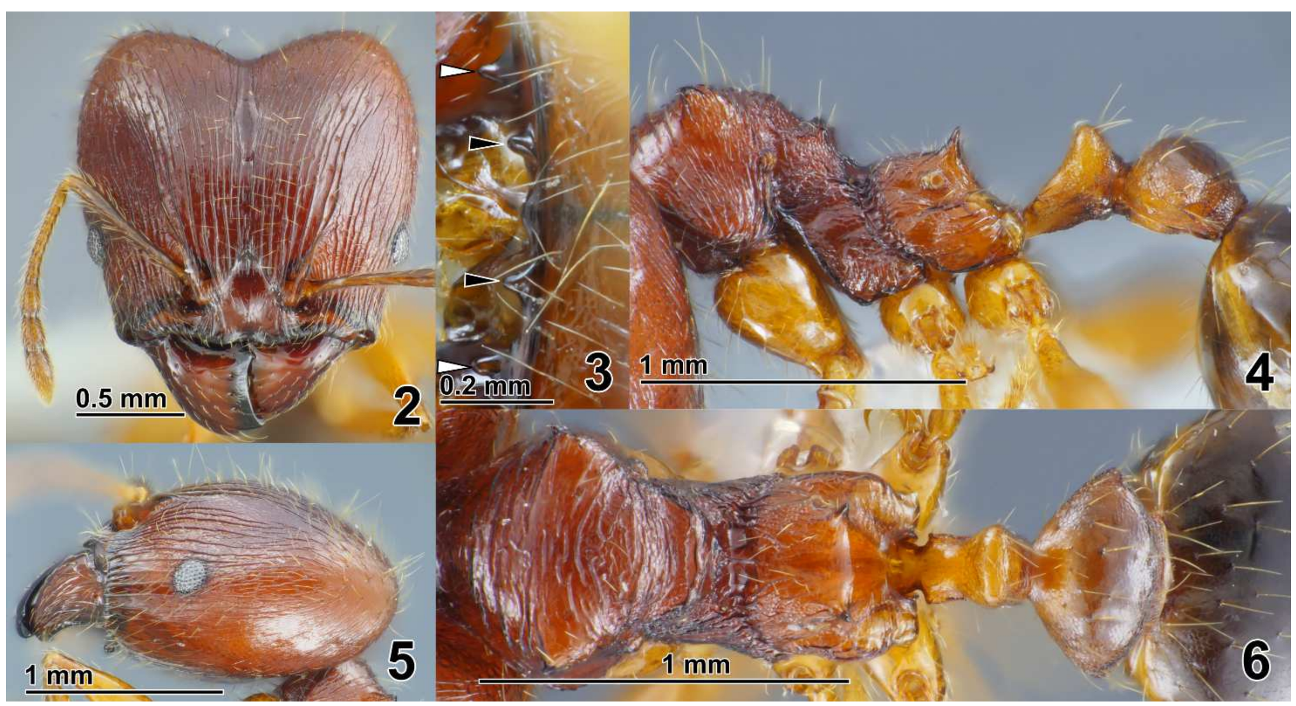
Material examined. 3 majors, 3 minors, colony ID: AKY08iii16-06, N 12°25'35-42", E 108°19'16-29", ca. 850m alt., Chu Yang Sin National Park, Dak Lak Province, Vietnam, 8. III. 2016, A. Yamada leg. (2 majors, 2 minors in IEBR; 1major, 1minor in TMUZ).

Material used for DNA barcoding. 1 minor, colony ID: AKY08iii16-06, individual ID: AIK20160418-12 (TMUZ). The 590 bp of barcode sequence is available at INSD (accession number: LC341396).

Measurements and indices. MAJOR. HL: 1.43–1.52 mm; HW: 1.46–1.54 mm; SL: 0.74–0.79 mm; PW: 0.66–0.67 mm; ML: 1.19–1.25 mm; PtL: 0.31–0.36 mm; PtW: 0.20–0.22 mm; PPtL: 0.28–0.33 mm; PPtW: 0.49–0.57 mm; CI: 101–103; SI: 51–54; PtI1: 103–120; PtI2: 39–43 (n = 3). MINOR. HL: 0.65–0.67 mm; HW: 0.62 mm; SL: 0.70–0.71 mm; PW: 0.40–0.41 mm; ML: 0.86–0.87 mm; PtL: 0.22–0.23 mm; PtW: 0.11 mm; PPtL: 0.24–0.27 mm; PPtW: 0.25–0.27 mm; CI: 93–95; SI: 112–114; PtI1: 80–94; PtI2: 41–44 (n = 3).

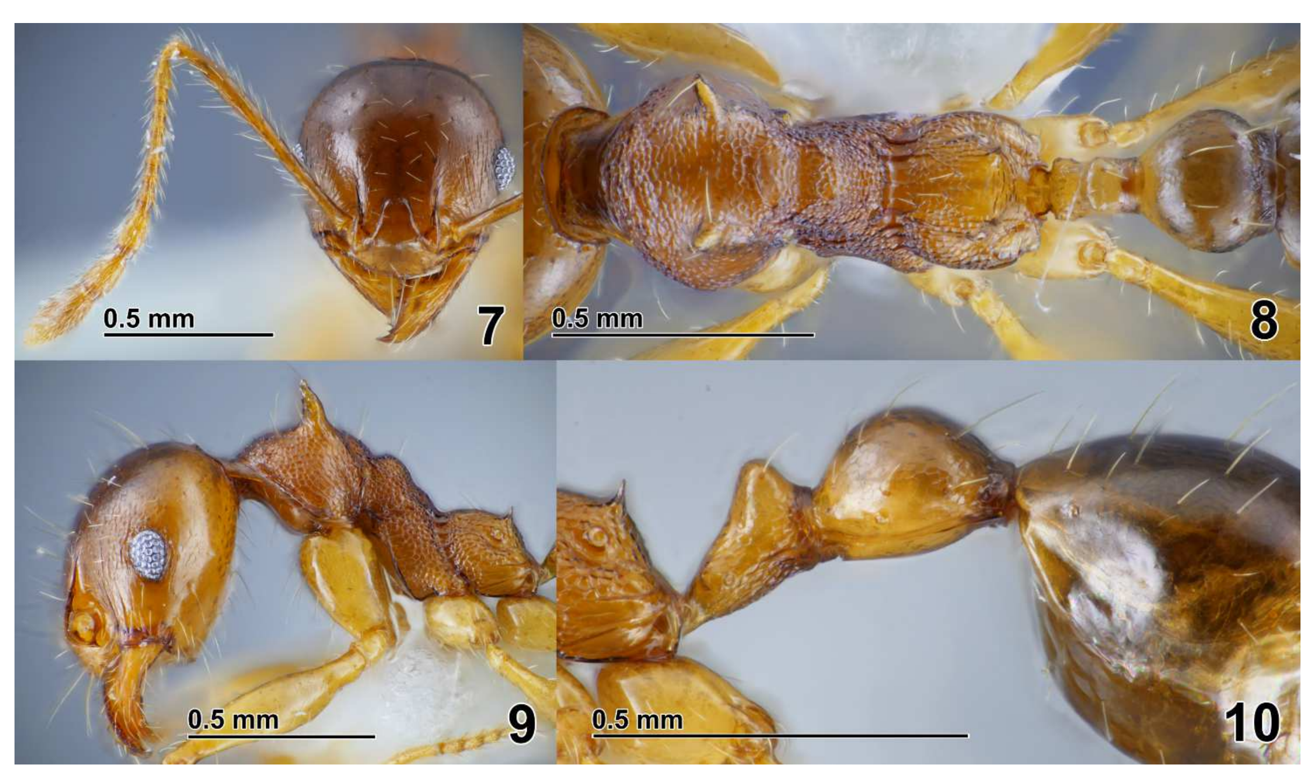
Diagnosis of the worker. *Pheidole hainanensis* can be distinguished from other Asian congeners by the combination of the following characters of the major and minor.

In the major, head in full-face view longitudinally rugose (Fig. 2), without deep impression on the vertex in lateral view (Fig. 5); hypostoma with inconspicuous median and conspicuous submedian processes (black arrows in Fig. 3) in addition to conspicuous lateral processes (white arrows in Fig. 3); pronotum with a pair of robust triangular angles (Figs. 4, 6); posterior slope of promesonotal dome in lateral view with a conspicuous prominence (Fig. 4); petiole in lateral view almost as long as or a little longer than postpetiole (PtI1: 103–120); petiolar node in dorsal view about 0.4 times as broad as postpetiole (PtI2: 39–43); first gastral tergite smooth and shiny (Fig. 6).



Figures 2–6. Major worker (colony ID: AKY08iii16-06) of *Pheidole hainanensis*. (2) Head in full-face view. (3) Hypostoma in ventral view; black and white arrows inidicate submedian processes and lateral processes respectively. (4) Mesosoma and waist in lateral view. (5) Head in lateral view. (6) Mesosoma and waist in dorsal view.

In the minor, the vertex of head smooth and shiny (Fig. 7); median clypeal carina absent; preoccipital carina conspicuous dorsally and laterally (Fig. 8); pronotum with a pair of short and robust spines (ca. 0.12 mm); posterior slope of promesonotal dome in lateral view with a conspicuous prominence (Fig. 9); mesosoma entirely punctate; propodeal spines very small (Fig. 10); petiole in lateral view a little shorter than postpetiole (PtI1: 80–94); petiolar node in dorsal view about 0.4 times as broad as postpetiole (PtI2: 41–44).



Figures 7–10. Minor worker (AKY08iii16-06) of *Pheidole hainanensis*. (7) Head in full-face view. (8) Mesosoma and waist in dorsal view. (9) Head and mesosoma in lateral view. (10) Waist and gaster in lateral view.

Remarks. In the genus *Pheidole*, the spinescent morphology of pronotum is seen in restricted species (Sarnat et al., 2017). Among other congeners in the Indo-Chinese Peninsula, only one species, *P. leloi* Eguchi & Bui, 2016, is known to exhibit the spinescence. However, *P. hainanensis* is easily distinguished from the *P. leloi* by the smooth vertex of head and a pair of shorter pronotal spines in the minor, and absence of distinct pronotal spines in the major (both the major and minor of *P. leloi* have a pair of elongate and pointed pronotal spines).

Acknowledgment

We would like to thank Assoc. Prof. Dr. Nguyen Van Sinh (Director of IEBR – Institute of Ecology and Biological Resources, Vietnam), Dr. Nguyen Duc Anh (IEBR), Dr. Phung Thi Hong Luong (IEBR), Dr. Rijal Satria (Andalas University, Indonesia), and the director and staff of Chu Yang Sin National Park for their help in the field survey; Assoc. Prof. Dr. Katsuyuki Eguchi (Tokyo Metropolitan University, Japan), Mr. Chi-Man Leong (National Taiwan University, Taiwan), and an anonymous reviewer for their valuable comments. This research is funded by the following foundations and societies: the Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Scientific Research (B, no. 26304014 and 16H05769; C, no. 15K07193 and 15K07805); Asahi Glass Foundation (Leader: Katsuyuki Eguchi; FY2017-FY2020); Tokyo Human Resources Fund for City Diplomacy.

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越南新紀錄種海南大頭家蟻之記述 (膜翅目：蟻科)

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摘要: 海南大頭家蟻 *Pheidole hainanensis* Chen, Ye, Lu, & Zhou, 2011 早前僅知分布於中國海南省，本文新紀錄海南大頭家蟻於越南多樂省朱楊申國家公園，同時提供粒線體細胞色素 c 氧化酶 I (COI) 的部分序列 (福爾梅區域 Folmer region) 作為未來 DNA 條碼研究之所需。

關鍵詞: 家蟻亞科、螞蟻、中南半島、DNA 條碼

臺灣研蟲誌 Taiwanese Journal of Entomological Studies 2(4): 13-15 (2017)

[研究文章 Research Article]

http://zoobank.org/urn:lsid:zoobank.org:pub:325AFAA9-9C30-49AA-8F0C-DBC3FEC7D4D2

Notes on an Earth-boring Scarab Beetle Species (Coleoptera: Geotrupidae) Collected from Snake Corpse in Taiwan

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Abstract. An earth-boring scarab beetle species, *Phelotrupes* (*Sinogeotrupes*) *insulanus* (Howden, 1965), was collected from a snake corpse in Central Taiwan, which is identified as *Ovophis makazayazaya* (Takahashi, 1922). This is the first record of *Phelotrupes* species collected from the snake corpse in Taiwan.

Key words: Necrophilous beetles, *Phelotrupes*, snake corpse, Taiwan

Introduction

The family Geotrupidae, also known as earth-boring scarab beetles, is featured by their characteristic biology to excavate burrows in which to lay eggs. Typically, geotrupids are detritivores while some are coprophagous (e.g., Nuorteva, 1977; Gennard, 2007). The Genus *Phelotrupes* include about 50 described species, and distributed in the Palaearctic and Oriental Regions (Ochi et al. 2017a). There are four described species in Taiwan: *Phelotrupes* (*Sinogeotrupes*) *insulanus* (Howden, 1965), *P.* (*S.*) *taiwanus* (Miyake & Yamaya, 1995), *P.* (*Eogeotrupes*) *chenwenlongi* Ochi, Masumoto & Lan, 2017 and *P.* (*E.*) *formosanus* (Miwa, 1930) (Ochi et al., 2017b).

Among the species, Howden (1965) described a new species, *Geotrupes insulana*, based on the specimens collected from Hassenzan [=Baxianshan, Taichung, Taiwan], Formosa, which equivalent to the present species, *P.* (*S.*) *insulanus* (Masumoto, 2014; Masumoto et al. 2015; Ochi et al. 2017b). Although the feeding habits of this species in cow dung and human dung have been recorded (Masumoto et al. 2015), the ecological record of their feeding habits is still not enough. The present study is the first record of a geotrupid species attracted by snake corpse.

Material and methods

In September 2017, a *Phelotrupes* species was collected under the snake corpse of *Ovophis makazayazaya* (Takahashi, 1922) (fig. 3) by hand from the dry ditch near Dasyueshan Logging Road. All photographs were taken by OLYMPUS PEN lite E-PL6 Camera and an OLYMPUS M. ZUIKO DIGITAL ED 60mm F2.8 Macro lens with two Kawasaki DF-480 SPEEDLITE flashlights. The voucher specimen was deposited in the B.-H. Ho's private collection, Taipei, Taiwan (BHC).

Results

***Phelotrupes* (*Sinogeotrupes*) *insulanus* (Howden, 1965)**

Chinese name: 島嶼掘地金龜、島嶼掘穴金龜、島嶼雪隱金龜

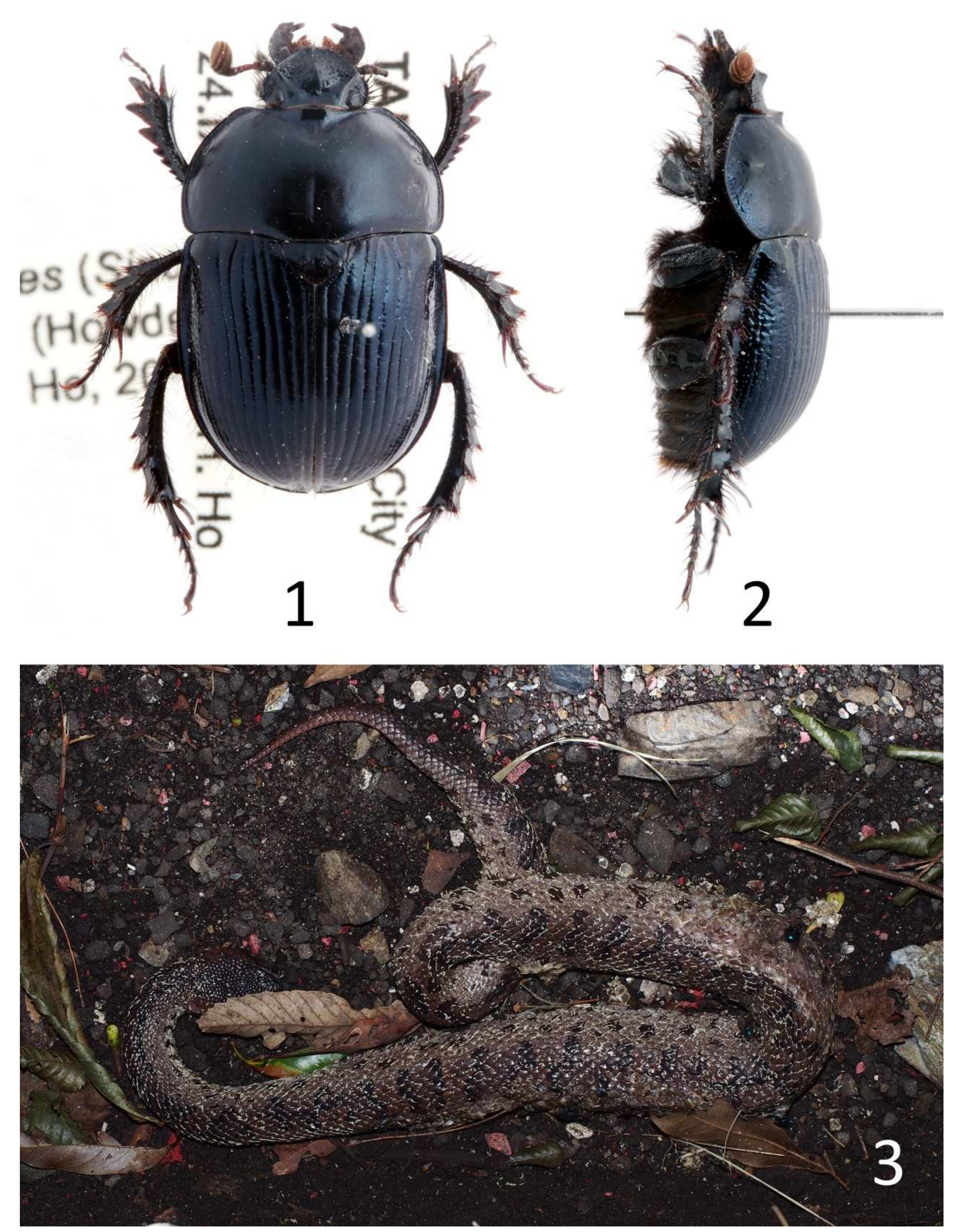
(Figs. 1–2)

Phelotrupes (*Sinogeotrupes*) *insulanus* (Howden, 1965)
Geotrupes insulana Howden, 1965

Material examined. 1♀, TAIWAN: Taichung Co./ Dasyueshan (大雪山), Heping/ alt. 2025m/ by snake corpse (*Ovophis makazayazaya*)/ 24. IX. 2017, Bin-Hong Ho & Yu-Hsiang Ho leg. (BHC).

稿件收到 *Received: 10 December 2017*
稿件接受 *Accepted: 24 December 2017*
稿件出版 *Published: 25 December2017*

Distribution. Taiwan and China (Fujian). (Howden, 1965; Masumoto, 2014; Masumoto et al. 2015; Ochi et al., 2017b)



Figures 1–3. Voucher specimen of *Phelotrupes* (*Sinogeotrupes*) *insulanus* (Howden, 1965) and natural snake corpse. 1–2. *P*. (*S*.) *insulanus*, female: 1. dorsal view; 2. lateral view. 3. A natural snake corpse, *Ovophis makazayazaya* (Takahashi, 1922).

Discussion

The importance of Geotrupidae on the forensic entomology has been documented. It is useful in indicating whether a body has been moved or not (Gennard, 2007). Our new discovery will be valuable in the future forensic entomological research in Taiwan. On the other hand, recent studies on the forest ecology have confirmed the significance of necrophilous beetles, which can be used as indicator species for monitoring the impacts of long-term climate changes on the species composition and community structure (Halffter & Favila, 1993; Hwang & Koh, 2013; Hwang et al., 2014). However, no earth-boring scarab beetle has been collected in these surveys. It is therefore the first record of this family on the corpse. The present paper not only improves the basic biological information on *Phelotrupes* (*Sinogeotrupes*) *insulanus* but also contributes on the future studies on the forensic entomology and forest ecology.

Acknowledgment

We are deeply grateful to Mr. Wei-Chieh Hsu (Institute of Wildlife Conservation, National Pingtung University of Science and Technology, Pingtung, Taiwan.) for identifying the species of snake corpse.

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臺灣首次自蛇類屍體中採集掘地金龜之短記 (鞘翅目：掘地金龜科)

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摘要: 島嶼掘地金龜 *Phelotrupes* (*Sinogeotrupes*) *insulanus* (Howden, 1965) 在瑪家山烙鐵頭 *Ovophis makazayazaya* (Takahashi, 1922) 的屍體中被發現，這是臺灣的掘地金龜屬自蛇屍中採集的首次野外觀察記錄。

關鍵詞: 親屍性甲蟲、掘地金龜屬、蛇屍、臺灣

臺 灣 研 蟲 誌

Taiwanese Journal of Entomological Studies

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發行單位 (Publisher)：臺 灣 昆 蟲 同 好 會
地址 (Address)：高 雄 市 大 樹 區 中 山 路 172 號
網站 (Website)：http://taisocinh.wixsite.com/taisocinsectnhweb
出版年月 (Date of publication)：西 元 2017 年 12 月 25 日
創刊年月 (First date of publication)：西 元 2016 年 12 月 25 日
刊期頻率 (Frequency)：季刊

臺 灣 昆 蟲 同 好 會

Taiwanese Society of Insect Natural History

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